

## CLAIMS

Having thus described the aforementioned invention, we claim:

1           1.     An apparatus for three dimensional image reconstruction from data  
2     acquired in a positron emission tomograph, said apparatus comprising:

3           an acquisition processor in communication with a PET scanner, said  
4     acquisition processor for receiving a plurality of event information and a plurality  
5     of bed position information;

6           a histogram processor in communication with said acquisition processor,  
7     said histogram processor for creating a histogram;

8           a transmission and attenuation processor in communication with said  
9     histogram processor, said transmission and attenuation processor for receiving  
10    said histogram;

11          a normalization processor in communication with said histogram processor,  
12    said normalization processor for normalizing a plurality of emission event  
13    information contained in said histogram;

14          a Mu image processor in communication with said transmission and  
15    attenuation processor, said Mu image processor for reconstructing a transmission  
16    data image;

17          an attenuation correction processor in communication with said  
18    transmission and attenuation processor and with said normalization processor;

19          a rebinning processor in communication with said attenuation correction  
20    processor, said rebinning processor for converting a 3D file into a 2D file;

21          an image reconstruction processor in communication with said rebinning  
22    processor;

23          a scatter correction processor in communication with said Mu image  
24    processor and with an image display processor; and

25           said image display processor in communication with said image  
26 reconstruction processor and with said scatter correction processor, said image  
27 display processor for producing an image file.

1           2.     The apparatus of Claim 1 wherein said acquisition processor accepts  
2 asynchronous data from said PET scanner.

1           3.     The apparatus of Claim 1 wherein said histogram processor accepts  
2 asynchronous data from said acquisition processor.

1           4.     The apparatus of Claim 1 wherein said transmission and attenuation  
2 processor is in synchronous communication with said histogram processor.

1           5.     The apparatus of Claim 1 wherein said normalization processor is in  
2 synchronous communication with said histogram processor.

1           6.     The apparatus of Claim 1 wherein said mu image processor is in  
2 synchronous communication with said transmission and attenuation processor.

1           7.     The apparatus of Claim 1 wherein said attenuation correction  
2 processor is in synchronous communication with said transmission and  
3 attenuation processor and with said normalization processor.

1           8.     The apparatus of Claim 1 wherein said rebinning processor is in  
2 synchronous communication with said attenuation correction processor.

1           9.     The apparatus of Claim 1 wherein said image reconstruction  
2 processor is in synchronous communication with said rebinning processor.

1           10.    The apparatus of Claim 1 wherein said scatter correction processor is  
2 in synchronous communication with said mu image processor and with said image  
3 display processor.

1           11.    The apparatus of Claim 1 wherein said image display processor is in  
2 synchronous communication with said image reconstruction processor and with  
3 scatter correction processor;

1           12.    The apparatus of Claim 1 wherein said rebinning processor  
2 implements a Fourier rebinning algorithm.

1           13.    An apparatus for three dimensional image reconstruction from data  
2 acquired in a positron emission tomograph, said apparatus comprising:

3                an acquisition processor in asynchronous communication with a PET  
4 scanner, said acquisition processor for receiving a plurality of event information  
5 and a plurality of bed position information;

6                a histogram processor in asynchronous communication with said  
7 acquisition processor, said histogram processor for creating a histogram;

8                a transmission and attenuation processor in synchronous communication  
9 with said histogram processor, said transmission and attenuation processor for  
10 receiving said histogram, said histogram corresponding to a plurality of  
11 transmission events;

12               a normalization processor in synchronous communication with said  
13 histogram processor, said normalization processor for normalizing said histogram,  
14 said histogram corresponding to a plurality of emission events;

15               a Mu image processor in synchronous communication with said  
16 transmission and attenuation processor, said Mu image processor for  
17 reconstructing a transmission data image;

an attenuation correction processor in synchronous communication with said transmission and attenuation processor and with said normalization processor;

a rebinning processor in synchronous communication with said attenuation correction processor, said rebinning processor for converting a 3D file into a 2D file;

an image reconstruction processor in synchronous communication with said rebinning processor;

a scatter correction processor in synchronous communication with said Mu image processor and with an image display processor; and

said image display processor in synchronous communication with said image reconstruction processor and with said scatter correction processor, said image display processor for producing an image file.

14. The apparatus of Claim 13 wherein said rebinning processor implements a Fourier rebinning algorithm.

15. An apparatus for three dimensional image reconstruction from data acquired in a positron emission tomograph, said apparatus comprising:

a means for acquisition processing and producing a set of acquired data;

a means for histogram processing said set of acquired data;

a means for transmission and attenuation processing;

a means for normalization processing;

a means for Mu image processing;

a means for attenuation correction processing;

a means for rebinning processing;

10 a means for image reconstruction processing;

11 a means for scatter correction processing; and

12 a means for image display processing.

1 16. The apparatus of Claim 15 wherein said means for histogram  
2 processing produces a set of histogram data;

1 17. The apparatus of Claim 15 wherein said means for transmission and  
2 attenuation processing produces a set of transmission-attenuation data;

1 18. The apparatus of Claim 15 wherein said means for normalization  
2 processing produces a set of normalized data.

1 19. The apparatus of Claim 15 wherein said means for mu image  
2 processing produces a set of mu image data.

1 20. The apparatus of Claim 15 wherein said means for attenuation  
2 correction processing produces a set of attenuation correction data.

1 21. The apparatus of Claim 15 wherein said means for rebinning  
2 processing produces a set of rebinning data.

1 22. The apparatus of Claim 15 wherein said means for image  
2 reconstruction processing produces a set of image reconstruction data.

1 23. The apparatus of Claim 15 wherein said means for scatter correction  
2 processing produces a set of scatter correction data.

1 24. The apparatus of Claim 15 wherein said means for image display  
2 processing produces a set of image display data.

1           25. A method for three dimensional image reconstruction from data  
2 acquired in a positron emission tomograph while the tomograph bed moves  
3 continuously, said method comprising the steps of:

4           a) acquiring data from a PET scanner and producing a set of acquired data;

5           b) histogramming said acquired data and producing a set of histogram data;

6           c) transmission and attenuation processing said set of histogram data and  
7 producing a set of transmission-attenuation data;

8           d) normalizing said set of histogram data and producing a set of normalized  
9 data;

10          e) reconstructing a mu image from said set of transmission-attenuation data  
11 and producing a set of mu image data;

12          f) attenuation correcting said set of transmission-attenuation data and said  
13 set of normalized data, said step of attenuation correction producing a set of  
14 attenuation data;

15          g) rebinning said set of attenuation data and producing a set of rebinned  
16 data

17          h) reconstructing an image from said set of rebinned data and producing a  
18 set of reconstructed image data;

19          i) scatter correcting said set of reconstructed image data and set of  
20 reconstructed image data, said step of scatter correcting producing a set of scatter  
21 corrected data;

22          j) creating an image file from said set of reconstructed image data and said  
23 set of scatter corrected data;

1           26.    The method of Claim 25 wherein said steps of b) histogramming, d)  
2   normalizing, f) attenuation correcting, g) rebinning, h) reconstructing, i) scatter  
3   correction, and j) creating an image file operate on a data set sequentially, with  
4   each step producing said data set before receiving a next data set.